



10-21-04

PATENT

Attorney Docket No. 2507-5813.1 USAP 3641
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NOTICE OF EXPRESS MAILING

Express Mail Mailing Label Number: EV 348040801 USDate of Deposit with USPS: October 20, 2004Person making Deposit: Christopher HoughtonIN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Serial No.: 10/046,008

Group Art Unit No.: 3641

Filing date: January 11, 2002

Examiner: A. Felton

For (title): LOW HUMIDITY UPTAKE SOLID PYROTECHNIC
COMPOSITION, AND METHOD OF MAKING THE
SAME

TRANSMITTAL OF BRIEF ON APPEAL

Commissioner of Patents
Alexandra, VA 22313-1450

Sir:

1. Transmitted herewith in triplicate is the APPEAL BRIEF in this application with respect to the Notice of Appeal filed on

2. STATUS OF APPLICATION

This application is on behalf of

- ☒ other than a small entity
☐ small entity

3. FEE FOR FILING APPEAL BRIEF

Pursuant to 37 C.F.R. § 1.17(f) the fee for filing the Appeal Brief is:

- ☐ small entity status \$160
☒ other than a small entity \$340.00

4. EXTENSION OF TIME

- ☐ A petition for Extension of Time for a month extension of time for filing the Appeal Brief is enclosed.

5. FEE PAYMENT

- ☒ Check No. 6806 is enclosed in payment of the fee for filing the Brief on Appeal.
☐ Please charge this fee to deposit account No. 20-1469 (a duplicate copy of this notice is enclosed—see below).

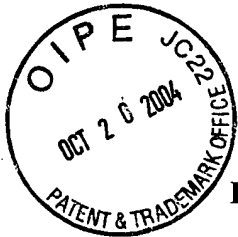
Any additional appeal fees which are not otherwise submitted herewith or which are insufficient should be charged to deposit account no. 20-1469.
A duplicate copy of this notice is enclosed. Please address all communications in connection with this appeal to the address indicated below.

Respectfully submitted,

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Date: October 20, 2004

Enclosures: As identified above



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Reed J. Blau

Serial No.: 10/046,008

Filed: January 11, 2002

For: LOW HUMIDITY UPTAKE SOLID
PYROTECHNIC COMPOSITION, AND
METHOD OF MAKING THE SAME

Confirmation No.: 5219

Examiner: A. Felton

Group Art Unit: 3641

Attorney Docket No.: 2507-5813.1US
(21839-US-01)

NOTICE OF EXPRESS MAILING

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APPEAL BRIEF

Mail Stop Appeal Brief – Patent
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sirs:

This brief is submitted in the format required under 37 C.F.R. § 41.37(c). A check in the amount of \$340.00 for the fee under 37 C.F.R. § 41.20(b)(2) for filing a brief in support of an appeal is enclosed.

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Serial No. 10/046,008

1) REAL PARTY IN INTEREST

The real party in interest in the present pending appeal is Alliant Techsystems Inc., Assignee of the pending application as recorded with the United States Patent and Trademark Office on January 11, 2002, at Reel 012508, Frame 0313.

2) RELATED APPEALS AND INTERFERENCES

The Appellant, the Appellant's representative, and the Assignee are not aware of any pending appeal or interference that would relate to, directly affect, be directly affected by, or have a bearing on the Board's decision in the pending appeal.

3) STATUS OF THE CLAIMS

Claims 1-8, 10-14, 16-25, 68, and 69 are pending in the application.

Claims 11-14, 20, 21, 23-25, 68, and 69 are withdrawn from consideration as being directed to a nonelected invention. Appellant considers claim 1 to be generic and notes that upon allowance of a generic claim, claims depending therefrom in a nonelected species would also be allowable. As such, claims 11-14, 20, 21, 23-25, 68, and 69 would be allowable as depending from claim 1.

Claims 9, 15, 26-67, and 70-73 are canceled.

Claims 1-8, 10, 16-19, and 22 stand rejected.

Claims 1-8, 10, 16-19, and 22 are the subject of the pending appeal.

4) STATUS OF AMENDMENTS

A Final Office Action (“Final Office Action”) was mailed on May 27, 2004, in which claims 1-8, 10, 16-19, and 22 were rejected under 35 U.S.C. § 103(a). In the Final Office Action, the Examiner relied on newly cited art, United States Patent No. 4, 128,443 to Pawlak *et al.* (“Pawlak”), to reject the pending claims. Final Office Action, p. 2. The Examiner also stated that Appellant’s previous amendments, which were filed on March 1, 2004, necessitated the new grounds of rejection. Final Office Action, p. 5.

In response to the Final Office Action, Appellant filed an Amendment Under 37 C.F.R. § 1.116 (“Amendment After Final”) on July 30, 2004, in which claim 1 was amended to correct a typographical error. Amendment After Final, p. 2. Appellant also argued against the finality of the Final Office Action due to the Examiner’s use of newly cited art in rejecting the pending claims. Amendment After Final, p. 7-8. Appellant also noted that the amendments filed on March 1, 2004, did not necessitate the new grounds of rejection because the claims were amended to recite subject matter that was already present in the claims and to improve antecedent basis. Amendment After Final, p. 8.

On August 13, 2004, an Advisory Action (“Advisory Action”) was mailed in which the rejection of claims 1-8, 10, 16-19, and 22 was maintained. The Advisory Action stated that the arguments raised new issues that required further search and consideration. While the Amendment After Final included additional arguments, these arguments were necessary to address the new art cited by the Examiner in the Final Office Action and did not raise new issues. In addition, the claim amendments merely corrected a typographical error and, therefore, did not raise new issues. Appellant filed a Notice of Appeal on August 26, 2004.

5) SUMMARY OF THE CLAIMED SUBJECT MATTER

The presently claimed invention is directed to a solid pyrotechnic composition that is a black powder substitute. See, the as-filed specification at p. 9, lines 10-12. The solid pyrotechnic composition includes oxidizer particles and organic crystalline particles. *Id.* The oxidizer particles have a mean particle size of not greater than about 30 microns, such from 5 microns to 20 microns. *Id.* at p. 9, lines 16-18. The oxidizer particles include at least one of an alkali metal nitrate and ammonium nitrate and at least one of an alkali metal perchlorate and ammonium perchlorate. *Id.* at p. 9, line 19 through p. 10, line 2. The alkali metal nitrate may be potassium nitrate and the alkali metal perchlorate may be potassium perchlorate. *Id.* The oxidizer particles account for about 40 weight percent to about 90 weight percent of a total weight of the pyrotechnic composition, such as from about 65 weight percent to about 80 weight percent of the solid pyrotechnic composition. *Id.* at p. 9, lines 13-16. For instance, the solid pyrotechnic composition may include from 0.5 weight percent to 30 weight percent of at least one of the alkali metal perchlorate and the ammonium perchlorate. *Id.* at p. 10, lines 8-10.

The organic crystalline particles account for about 10 weight percent to about 60 weight percent of the total weight of the solid pyrotechnic composition. *Id.* at p. 10, lines 12-16. The organic crystalline particles are selected from at least one of phenolphthalein, an organic crystalline compound derived from a reaction between a phenolic compound and phthalic anhydride, fluorescein, 1,5-naphthalenediol, anthraflavic acid, and terephthalic acid. *Id.* at p. 10, line 27 through p. 11, line 13. The solid pyrotechnic composition is free of sulfur. *Id.* at p. 5, lines 18-21. The solid pyrotechnic composition may also be free of charcoal. *Id.*

The solid pyrotechnic composition may optionally include a nonhygroscopic polymeric binder, such as a binder having a moisture uptake of not more than 4 weight percent at 75 percent relative humidity at a temperature of 21.1°C (70°F) over a period of 24 hours. *Id.* at p. 11, lines 14-19. The nonhygroscopic polymeric binder may be poly(vinyl acetate), ethyl cellulose, or nylon. *Id.* at p. 11, lines 19-23. If present, the nonhygroscopic polymeric binder may constitute no more than about 10 weight percent of the total weight of the solid pyrotechnic composition, such as from 3 weight percent to 6 weight percent of the total weight of the solid pyrotechnic composition. *Id.* at p. 11, line 26 through p. 12, line 2.

6) GROUND OF REJECTION TO BE REVIEWED ON APPEAL

A.1. Claims 1-8 and 22 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Pawlak in view of United States Patent No. 5,569,875 to Fey (“Fey”).

A.2. Claim 10 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Pawlak in view of Fey and further in view of H72 to Wise *et al.* (“Wise”).

A.3. Claims 16-19 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Pawlak in view of Fey and further in view of U.S. Patent No. 5,320,691 to Weber (“Weber”).

7) ARGUMENT

STANDARD OF PATENTABILITY UNDER 35 U.S.C. § 103(a)

Rejection of claims under 35 U.S.C. § 103(a) requires that the U.S. Patent and Trademark Office (the “Office”) establish a *prima facie* case of obviousness. M.P.E.P. § 2142. M.P.E.P. 706.02(j) sets forth the standard for an obviousness rejection:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

To provide a motivation or suggestion to combine, the prior art or the knowledge of a person of ordinary skill in the art must "suggest the desirability of the combination" or provide "an objective reason to combine the teachings of the references." M.P.E.P. § 2143.01. It is improper to combine references where the references teach away from combination. M.P.E.P. § 2145.

In view of this standard and the arguments set forth below, Appellant respectfully submits that the Office has not established a *prima facie* case of obviousness under 35 U.S.C. § 103(a).

A.1 REJECTION OF CLAIMS 1-8 AND 22 UNDER 35 U.S.C. § 103(a) OVER PAWLAK IN VIEW OF FEY

In the Final Office Action, the Examiner rejected claims 1-8 and 22 under 35 U.S.C. § 103(a) as being unpatentable over Pawlak in view of Fey.

Appellant submits that the obviousness rejection of claims 1-8 and 22 is improper and should be reversed because the cited references do not teach or suggest all of the claim limitations and do not provide a motivation to combine to produce the claimed invention.

A.1A Claims 1-4

Independent claim 1 recites a solid pyrotechnic composition having a total weight. The

solid pyrotechnic composition comprises about 40 weight percent to about 90 weight percent oxidizer particles having a mean particle size of not greater than about 30 microns. The oxidizer particles comprise at least one of an alkali metal nitrate and ammonium nitrate and at least one of an alkali metal perchlorate and ammonium perchlorate. The solid pyrotechnic composition also comprises organic crystalline particles that account for about 10 weight percent to about 60 weight percent of the total weight of the solid pyrotechnic composition. The organic crystalline particles comprise at least one of phenolphthalein, an organic crystalline compound derived from a reaction between a phenolic compound and phthalic anhydride, fluorescein, 1,5-naphthalenediol, anthraflavic acid, and terephthalic acid. The solid pyrotechnic composition is free of sulfur.

Pawlak teaches a gas producing deflagrating composition that provides propulsion to projectiles. Column 2, lines 16-21. The composition includes a substantially homogenous mixture of 30-82.5 parts by weight of an oxygen-containing oxidizing agent, 14.5-45 parts by weight of a carboxylic acid or oxidizable derivative, and 1.0-25.0 parts by weight of water. Column 2, lines 30-38. Pawlak teaches that water is essential in its composition to control a burning rate of the composition, to act as a coolant, and to provide water vapor. Column 5, lines 36-39 and 52-63.

Fey teaches an explosive composition that includes an inorganic oxidizing agent and a fuel that is formed as a reaction product of a transition metal or transition metal compound and an organic acid, such as ascorbic acid or erythorbic acid. Column 3, lines 7-11. The transition metal or transition metal compound is iron, iron hydroxide, or iron oxide. *Id.* at lines 13-18. The inorganic oxidizing agent is a nitrate-containing inorganic oxidizer. *Id.* at lines 29-32. The

inorganic oxidizing agent and the fuel are present in the explosive composition as highly polished granules. Column 5, lines 18-33. Fey teaches that it is undesirable for explosive compositions to be hygroscopic because the water negatively affects performance and product life. Column 1, lines 39-41. Fey also teaches that the reduced hygroscopicity of its explosive composition is due to the highly polished granules of the inorganic oxidizing agent and the fuel. Column 5, lines 30-33.

The cited references do not teach or suggest all of the limitations of claim 1 because they do not teach or suggest the limitation of “organic crystalline particles accounting for about 10 weight percent to about 60 weight percent of the total weight of the solid pyrotechnic composition.” While Pawlak teaches using a carboxylic acid or oxidizable derivative in its composition, Pawlak is silent about the form of the carboxylic acid or oxidizable derivative that is used. Specifically, Pawlak does not teach or suggest that the carboxylic acid or oxidizable derivative is present in its composition as crystalline particles. Fey also does not teach or suggest using organic crystalline particles in its explosive composition. Rather, Fey teaches that the fuel is ground to a fine powder and “has the consistency of talc without any crystals or particulate matter present.” Column 7, lines 52-60.

The cited references also do not provide a motivation to combine to produce the claimed invention. The Examiner acknowledges that Pawlak does not teach using “a mixture of oxidizers with amounts or a particular particle size of the oxidizers” and relies on Fey as teaching this limitation. Final Office Action, p. 3. The Examiner states that “[i]t would have been obvious to one having ordinary skill in the art at the time the invention was made to use a mixture of oxidizers as taught by Fey since Fey suggests that it is known to use a mixture of oxidizers with a

certain particle size in a similar composition to that disclosed by Pawlak that is a substitute for black powder.” *Id.*

Appellant respectfully disagrees. The Examiner’s proposed motivation to combine is not an objective reason that supports combination of the cited references because nothing in the cited references, when combined, suggests the desirability of the combination or provides an objective reason to combine. Instead, the Examiner’s proposed motivation is conclusory and is not based on objective evidence of record. Nothing in Pawlak suggests the desirability of using a mixture of oxidizers or provides any teaching or suggestion for the amount of the oxidizer or a particular particle size of the oxidizer to be used in the composition. In addition, nothing in Fey suggests the desirability of using mixtures of oxidizers or oxidizers having an average particle size of 15 μm in other explosive composition, such as in the composition of Pawlak.

The cited references also teach away from combination because Pawlak teaches that water is essential in its composition while Fey teaches that the presence of water reduces the performance of explosive compositions. Pawlak teaches that the water is essential in its composition to control the burning rate of the composition, to act as a coolant, and to provide water vapor. Column 5, lines 36-39 and 52-63. Pawlak also teaches that this feature of its composition is different from the prior art, which teaches that water is deleterious. *Id.* at lines 39-41. In contrast, Fey teaches that if an explosive composition, such as black powder, is hygroscopic, its performance, storage, and handling properties are affected. Column 1, lines 39-41. As such, if the explosive composition includes water, its performance will be negatively affected. Fey also teaches that its composition is less hygroscopic than black powder due to the highly polished granules of the inorganic oxidizing agent and the fuel. Column 5, lines 30-33.

After reading the cited references, one of ordinary skill in the art would not be motivated to combine Pawlak and Fey to produce the claimed invention because each of Pawlak and Fey teaches that water has opposite effects on the performance of the explosive composition.

Furthermore, even if Pawlak and Fey were combined, the claimed invention would not be produced because the resulting composition would not include organic crystalline particles.

Since the cited references do not teach or suggest all of the claim limitations and do not provide a motivation to combine, a *prima facie* case of obviousness of claim 1 has not been established by the Office. As such, claim 1 is allowable.

If an independent claim is nonobvious, then any claim depending from the independent claim is also nonobvious. M.P.E.P. § 2143.03. Therefore, claims 2-4 are allowable as depending from an allowable base claim.

As such, Appellant respectfully requests that the rejection of claims 1-4 under 35 U.S.C. § 103(a) be reversed.

A.1B Claim 5

Claim 5 is further allowable because the cited references do not teach or suggest that the oxidizer particles constitute 65 weight percent to 80 weight percent of the solid pyrotechnic composition.

As such, Appellant respectfully requests that the rejection of claim 5 under 35 U.S.C. § 103(a) be reversed.

A.1C Claim 6

Claim 6 is further allowable because the cited references do not teach or suggest that 0.5 weight percent to 30 weight percent of the total weight of the solid pyrotechnic composition consists of the at least one of an alkali metal perchlorate and ammonium perchlorate.

As such, Appellant respectfully requests that the rejection of claim 6 under 35 U.S.C. § 103(a) be reversed.

A.1D Claim 7

Claim 7 is further allowable because the cited references do not teach or suggest that 5 weight percent to 20 weight percent of the total weight of the solid pyrotechnic composition consists of the at least one of an alkali metal perchlorate and ammonium perchlorate.

As such, Appellant respectfully requests that the rejection of claim 7 under 35 U.S.C. § 103(a) be reversed.

A.1E Claim 8

Claim 8 is further allowable because the cited references do not teach or suggest that 5 weight percent to 20 weight percent of the total weight of the solid pyrotechnic composition consists of potassium perchlorate.

As such, Appellant respectfully requests that the rejection of claim 8 under 35 U.S.C. § 103(a) be reversed.

A.1F Claim 22

Claim 22 is further allowable because the cited references do not teach or suggest that the solid pyrotechnic composition is free of charcoal.

As such, Appellant respectfully requests that the rejection of claim 22 under 35 U.S.C. § 103(a) be reversed.

A.2 REJECTION OF CLAIM 10 UNDER 35 U.S.C. § 103(a) OVER PAWLAK IN VIEW OF FEY AND FURTHER IN VIEW OF WISE

In the Final Action, the Examiner rejected claim 10 under 35 U.S.C. § 103(a) as being unpatentable over Pawlak in view of Fey as applied to claims 1-8 and 22 and further in view of Wise.

Appellant submits that the 35 U.S.C. § 103(a) rejection of claim 10 is improper and should be reversed because the cited references do not provide a motivation to combine to produce the claimed invention.

The teachings of Pawlak and Fey are as previously summarized.

Wise teaches a pyrotechnic composition having potassium nitrate, sulfur, and an organic crystalline compound as a fuel. Column 2, lines 10-44. The organic crystalline compound is fluorescein, phenolphthalein, 1,5-naphthalenediol, phenolphthalein, anthraflavic acid, or terephthalic acid. *Id.* at lines 10-44.

Claim 10 depends on claim 1 and, therefore, is allowable, *inter alia*, as depending from an allowable base claim.

Claim 10 is also allowable because the cited references do not provide a motivation to combine to produce the claimed invention. As acknowledged by the Examiner, Pawlak and Fey

do not teach or suggest using phenolphthalein. Final Office Action, p. 4. Therefore, the Examiner relies on Wise as teaching this limitation. *Id.* The Examiner states that “[i]t would have been obvious to one having ordinary skill in the art at the time the invention was made to use the phenolphthalein as the organic compound with the compositions disclosed and taught by Pawlak and Fey since Wise suggests that it is known organic compound to be used as a fuel.” *Id.*

However, the Examiner’s proposed motivation is not an objective reason that supports combination of Pawlak, Fey, and Wise because nothing in the cited references, when combined, suggests the desirability of the combination or provides an objective reason to combine. Rather, the Examiner’s proposed motivation is conclusory and is not based on objective evidence of record. Nothing in Pawlak or Fey, when combined, suggests the desirability of using phenolphthalein as a fuel, as acknowledged by the Examiner. In addition, Wise does not provide any suggestion to use phenolphthalein in other explosive compositions, such as in the compositions of Pawlak or Fey.

As such, Appellant respectfully requests that the obviousness rejection of claim 10 be reversed.

A.3 REJECTION OF CLAIMS 16-19 UNDER 35 U.S.C. § 103(a) OVER PAWLAK IN VIEW OF FEY AND FURTHER IN VIEW OF WEBER

In the Final Action, the Examiner rejected claims 16-19 under 35 U.S.C. § 103(a) as being unpatentable over Pawlak in view of Fey as applied to claims 1-8 and 22 and further in view of Weber.

Appellant submits that the 35 U.S.C. § 103(a) rejection of claims 16-19 is improper and should be reversed because the cited references do not provide a motivation to combine to

produce the claimed invention.

The teachings of Pawlak and Fey are as previously summarized.

Weber teaches an energetic composition having phenolphthalein, potassium nitrate, and sulfur. Column 1, lines 38-43. The energetic composition also includes a vinyl acetate polymer. Column 3, lines 53-57.

Claim 16 depends on claim 1 and, therefore, is allowable, *inter alia*, as depending from an allowable base claim. Claims 17-19 depend on claim 16 and, therefore, are allowable, *inter alia*, as depending from an allowable base claim.

A.3A Claim 16

Claim 16 is further allowable because the cited references do not provide a motivation to combine to produce the claimed invention. As acknowledged by the Examiner, Pawlak does not teach or suggest that its composition includes a nonhygroscopic polymeric binder. Final Office Action, p. 4. Therefore, the Examiner relies on Weber as teaching this limitation. *Id.* at p. 5. The Examiner states that “[i]t would have been obvious to one having ordinary skill in the art at the time the invention was made to use the binder as taught by Weber with the composition of Pawlak, since Weber teaches that it is a known binder to be used in a composition that is a substitute for black powder and because Pawlak discloses that binders can be used.” *Id.* However, the Examiner’s proposed motivation to combine is conclusory and is not based on objective evidence of record. While Pawlak teaches that a binder is used in its composition, Pawlak does not specifically teach using a nonhygroscopic binder. Furthermore, since Pawlak teaches that water is essential in its composition, the binder used in its composition is unlikely to

be nonhygroscopic. In addition, nothing in Pawlak, Fey, or Weber, when combined, suggests the desirability of the combination or provides an objective reason to combine. Specifically, nothing in Pawlak or Fey suggests the desirability of using a nonhygroscopic polymeric binder. Weber also does not suggest the desirability of using a nonhygroscopic polymeric binder in other explosive compositions, such as those of Pawlak and Fey.

As such, Appellant respectfully requests that the obviousness rejection of claim 16 be reversed.

A.3B Claim 17

Claim 17 is further allowable because the cited references do not teach or suggest that the nonhygroscopic polymeric binder constitutes no more than about 10 weight percent.

As such, Appellant respectfully requests that the obviousness rejection of claim 17 be reversed.

A.3C Claim 18

Claim 18 is further allowable because the cited references do not teach or suggest that the nonhygroscopic polymeric binder constitutes from 3 weight percent to 6 weight percent of the solid pyrotechnic composition.

As such, Appellant respectfully requests that the obviousness rejection of claim 18 be reversed.

A.3D Claim 19

Claim 19 is further allowable because the cited references do not teach or suggest that the nonhygroscopic polymeric binder comprises poly(vinyl acetate).

As such, Appellant respectfully requests that the obviousness rejection of claim 19 be reversed.

8) CLAIMS APPENDIX

A copy of claims 1-8, 10, 16-19, and 22 is appended hereto as “Appendix A.”

CONCLUSION

Appellant respectfully submits that claims 1-8, 10-14, 16-25, 68, and 69 are allowable over the cited references of record. Appellant respectfully requests that the rejections of claims 1-8, 10, 16-19, and 22 under 35 U.S.C. § 103(a) be reversed.

Respectfully submitted,

A handwritten signature in black ink that reads "Katherine A. Hamer". The signature is written in a cursive style with a large, stylized 'K' and 'H'.

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Date: October 20, 2004
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APPENDIX A

Claims 1-8, 10, 16-19, and 22

U.S. Patent Application No. 10/046,008

Filed January 11, 2002

1. A solid pyrotechnic composition having a total weight, the solid pyrotechnic composition comprising:
about 40 weight percent to about 90 weight percent oxidizer particles, the oxidizer particles having a mean particle size of not greater than about 30 microns and comprising at least one of an alkali metal nitrate and ammonium nitrate and at least one of an alkali metal perchlorate and ammonium perchlorate; and
organic crystalline particles accounting for about 10 weight percent to about 60 weight percent of the total weight of the solid pyrotechnic composition, wherein the organic crystalline particles comprise at least one of phenolphthalein, an organic crystalline compound derived from a reaction between a phenolic compound and phthalic anhydride, fluorescein, 1,5-naphthalenediol, anthraflavic acid, and terephthalic acid, wherein the solid pyrotechnic composition is free of sulfur.

2. The solid pyrotechnic composition according to claim 1, wherein the oxidizer particles comprise potassium nitrate.

3. The solid pyrotechnic composition according to claim 1, wherein the oxidizer particles comprise potassium perchlorate.

4. The solid pyrotechnic composition according to claim 1, wherein the mean particle size of the oxidizer particles is in a range of 5 microns to 20 microns.

5. The solid pyrotechnic composition according to claim 1, wherein the oxidizer particles constitute 65 weight percent to 80 weight percent of the solid pyrotechnic composition.

6. The solid pyrotechnic composition according to claim 1, wherein 0.5 weight percent to 30 weight percent of the total weight of the solid pyrotechnic composition consists of the at least one of an alkali metal perchlorate and ammonium perchlorate.

7. The solid pyrotechnic composition according to claim 1, wherein 5 weight percent to 20 weight percent of the total weight of the solid pyrotechnic composition consists of the at least one of an alkali metal perchlorate and ammonium perchlorate.

8. The solid pyrotechnic composition according to claim 1, wherein 5 weight percent to 20 weight percent of the total weight of the solid pyrotechnic composition consists of potassium perchlorate.

10. The solid pyrotechnic composition according to claim 1, wherein the organic crystalline particles comprise phenolphthalein.

16. The solid pyrotechnic composition according to claim 1, further comprising a nonhygroscopic polymeric binder, the nonhygroscopic polymeric binder having a moisture uptake of not more than 4 weight percent at 75 percent relative humidity at a temperature of

21.1°C (70°F) over a period of 24 hours.

17. The solid pyrotechnic composition according to claim 16, wherein the nonhygroscopic polymeric binder constitutes no more than about 10 weight percent of the total weight of the solid pyrotechnic composition.

18. The solid pyrotechnic composition according to claim 16, wherein the nonhygroscopic polymeric binder constitutes 3 weight percent to 6 weight percent of the total weight of the solid pyrotechnic composition.

19. The solid pyrotechnic composition according to claim 16, wherein the nonhygroscopic polymeric binder comprises poly(vinyl acetate).

22. The solid pyrotechnic composition according to claim 1, wherein the solid pyrotechnic composition is free of charcoal.